TKT Consulting, LLC

2050 Driscoll Dr · RENO, NV 89509

August 26, 2015

Environmental Restoration LLC
1666 Fabick Dr
St Louis, MO 63026
Atn: Jan Rick

Dear Reviewer,

TKT Consulting, LLC (TKT) appreciates the opportunity to provide the following proposal to Environmental Restoration LLC (ER) in response to Request for Proposal GK8-77 "Interim Water Treatment Plant, Gold King Mine, Cement Creek Mining District, Silverton, Colorado".

TKT has provided a proposal for what we believe is the most feasible, cost effective and best solution to meet the immediate needs of EPA and its contractors to respond to the emergency release from the Gold King Mine, given the timing and location of the project. The proposed work will result in treatment of up to 40 million gallons of acid mine drainage. TKT has responded to similar instances at various sites under extreme conditions like those that will likely be encountered at the Gladstone site and has successfully met discharge requirements without any lost time incidents or releases to the environment.

TKT also has direct experience treating acid mine drainage at the Gladstone site with equipment very similar to the equipment proposed. The work was funded by the Bureau of Land management in 2008. While conducting the treatability study, TKT worked closely with EPA and it's contractor who was required to provide the sampling and analytical and reporting for the treatability study. TKT successfully treated up to 300 gpm and was able to meet discharge standards for most of the metals in a single stage treatment. TKT completed a thorough review of the report and commented on the problems with sampling/analytical which rendered much of the data useless. TKT has provided a copy of this review as a supplement to the proposal to provide clarity and insight to any reports you may have encountered.

TKT is confident that it can execute the proposed work in the timeline specified in the proposal. TKT owns most of the equipment and is ready to mobilize immediately upon reward of this contract.

Very truly yours,
TKT CONSULTING, LLC

Timothy K. Tsukamoto, Ph.D.
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TKT Consulting, LLC

2050 Driscoll Dr · **RENO, NV 89509**
775-**846-9659**

Proposal to Provide Emergency Treatment for Gold King Mine Discharge

Prepared For

Environmental Restoration LLC

And

United States Environmental Protection Agency Region 8
Emergency and Rapid Response Services Contract
Task Order #77
Request for Proposal GK8-77
Interim Water Treatment System

August 26, 2015

CONFIDENTIALITY AGREEMENT

By accepting delivery of this TKT Consulting, LLC Proposal for Product or Services ("Proposal") through any medium, the party identified on the first page of this Proposal (the "Party") agrees that the Proposal's contents and all information delivered by TKT Consulting, LLC. to Party that is related to the content of this Proposal is TKT Consulting LLC's confidential, proprietary information ("Proprietary Information"). The Party agrees that the Proprietary Information shall be used only by the Party and its designated agents for the sole purpose of evaluating whether to engage TKT Consulting, LLC. for the services and products described in the Proposal. The Party agrees that the Proprietary Information shall not be used for any other purpose and shall not be disclosed, shared with or distributed to anyone other than the Party and its designated agents, each of whom shall be bound by same terms of confidentiality as those to which the Party is bound by this Confidentiality Agreement. The Party shall distribute the Proprietary Information to third parties only after receiving specific written approval to do so from an authorized agent of TKT Consulting, LLC.

Site Background

The Upper Gold King Mine – 7 Level portal is located at elevation 11,450 feet on the north side of the North Fork Cement Creek, approximately eight miles north of Silverton, Colorado. During an investigation phase the material holding back the mine pool failed and released an estimated 3 million gallons of water. The mine is currently discharging approximately 500gpm of water that requires treatment to raise pH and remove dissolved metals and suspended solids.

General Scope of Work

The U.S. Environmental Protection Agency (EPA) has tasked Environmental Remediation, LLC (ER) under ERRS Region 8 Contract Number EPS81302, to procure and manage the installation, operation and maintenance of an interim water treatment plant (TKTP) designed to manage water discharged from the Gold King Mine – 7 Level adit in San Juan County near Silverton, Colorado.

Description of Work

The construction location will be in Gladstone, Colorado. ER will grade the location and develop access for 18-wheel trucks. Mine water will be conveyed to the treatment plant in a 6" HDPE feed line. There will be a secondary backup feed line. ER will be responsible for getting the water to the TKTPs inlet at a pressure (psi) specified by TKT.

TKT Consulting, LLC (TKT) will provide a Health & Safety Plan for installation and operation, mobilization, structural installation, technical oversight, weekly reporting, operations and demobilization.

It is assumed that generated waste will be shipped off site by ER in compliance with EPA's CERCLA off-site rule and all existing laws and regulations of the United States, State, County, Township or other Governmental agency, where applicable. All offsite disposal including manifesting, documentation, and final disposition shall be performed by the ER Response Manager and signed and approved by the EPA OSC prior to removal and transportation for disposal. TKT has provided recommendations for drying of sludge over the winter to aid in the drying process, reduce sludge volumes and reduce the risks involved in offsite removal during the winter months.

Contingencies and Project Requirements

TKT Consulting LLC provides the following proposal with contingencies, due to the limited time available to complete a design for a full scale, winterized treatment system. TKT believes that the proposed system is the most feasible, effective and cost effective system to mobilize within three weeks and begin treating water. TKT **does** believe that this system can be winterized and operated through the winter months, with the addition of a few components including a heated building, a more permanent and highly automated lime feed system, flocculation system and more advanced solids removal system. However, in the short time frame, TKT will not be able to provide the upfront capital outlay for these additional items. If these capital improvements were provided by the client or if the client were to provide a down payment to secure these items TKT believes the system could be constructed and operated through the winter. In addition, TKT cannot provide the bonds required in the short time frame spelled out in the RFP.

The system proposed by TKT will result in a high percentage removal of the dissolved metals and suspended solids through neutralization, precipitation and filtration. This proposed system will not remove 100% of the solids or color. In fact, no flocculation/filtration system will remove 100% of solids and color from the treated effluent. The efficiency will depend upon the amount of filtration that can occur in the proposed dewatering system. The system will also maintain a neutral pH to the extent practical, although upsets are not expected, they could occur. The addition of a discharge pond would allow for temporary upsets in the system to be buffered out, however due to the time limitations and a lack of information regarding the amount of space available TKT has not proposed to install a discharge buffering pond. If such a pond was installed by the client it would improve solids/color removal, although if not

designed properly freezing could be problematic in the winter months. TKT has successfully designed and utilized a polishing pond in similar environments at the Zortman/Landusky mine in Northern Montana.

The treatment is being proposed for 8 weeks, however if extremely cold conditions are encountered, freezing conditions may force shut-down prior to the end of the 8 week period. TKT has operated successfully outdoors at the Leviathan mine with overnight lows well below freezing, but extremely cold temperatures (approaching 0^{o} F), or extended periods of freezing conditions (throughout the day and night) will force shut-down. If this occurs the client will only be charged for the number of actual weeks of operation according to Bid Item 3.0. TKT will provide system operation and maintenance for the duration of time the system is on site.

It is imperative that the client is able to keep the road open to allow for deliveries. The system will require daily visits and deliveries. If deliveries cannot be made there is a chance that damage could occur to system components. TKT will not be held liable if such an incident was to occur and the client would be responsible to pay for any damages incurred on rented equipment or equipment owned by TKT.

TKT also requires assurances that, providing all reasonable and prudent caution, releases may occur due to acts of God (Weather, avalanche, etc.) and as an EPA contractor; TKT is exempt from liability under CWA and CERCLA.

Personnel

TKT's work and tasks will be given the constant attention and diligence necessary to facilitate the successful progress thereof, and will cooperate with the ER's and the EPA's representative in every way necessary to the successful completion of the project. TKT will have a competent superintendent on site during all construction activities.

Key Personnel. Key project personnel are listed below. Timothy Tsukamoto has primary responsibility for implementation of this emergency response project.

TKT Consulting, LLC (TKT). TKT will provide technical specialization with water treatment and oversight, including but not limited to planning, scheduling, and coordinating the project team and communication with ER and EPA. TKT will supply the majority of the treatment system and will provide any subcontractor oversight during field activities that may occur at the Site. TKT key personnel are:

Project Manager	Timothy Tsukamoto, PhD.	(775) 846-9659
Field Technician	Joe Smith	(775) 686-8561
Field Technician	Steve Schulze	(775) 225-2656
Field Technician	Timothy Herrera	(505) 252-9382
Field Technician/labor	Payton Tsukamoto	(775) 742-4249

Representative Project Experience

Timothy Tsukamoto (Resume attached) is TKT's lead scientist. With more than 29 years of experience in mining, the majority in mine water treatment, Tim is recognized internationally as an expert in mine water treatment and prevention of acid mine drainage. He has presented papers at the local, national and international level and has published over 40 technical papers and presentations.

Timothy Tsukamoto has designed 15 full scale or emergency water treatment systems, most of which are still operating today. Most of these systems are located in remote locations, at high elevation and experience extreme winters, such as the Zortman/Landusky mine (Northern Montana), the Leviathan mine (Sierra Nevada Mountains), the Kensington mine (Alaska), the Bear Track Mine (Idaho) and the Elizabeth mine (Vermont). A more complete list of projects can be found in Timothy Tsukamoto's attached resume.

In addition, Timothy Tsukamoto has treated water at Gladstone using an RCTS. The Bureau of Land Management hired Timothy Tsukamoto with Ionic Water Technologies to conduct a treatability study of the American Tunnel discharge and directly from Cement Creek. The small mobile system (approximately one-half the size of the proposed system) treated up to 300 gpm effectively. EPA hired an outside firm to take samples and provide a report for the Treatability Study. I have attached the Report with IWT's comments. There were significant issues with sampling and analytical. For example the blanks often had higher concentrations of metals than the effluent samples and dissolved metal concentrations often were higher than the total metal concentration in the same sample. Regardless of the sampling and analytical issues the system successfully treated the two sources of water meeting nearly all discharge standards in a single stage treatment and showed efficient lime usage and sludge reduction. The outside firm's comparison of the system with the Argo Tunnel and Summitville water treatment systems showed our system to require "significantly less lime than the two other systems".

Tim Tsukamoto has worked closely with EPA (particularly Edward Bates and David Reisman) on several projects including but not Limited to the Gladstone mine (CO), Elizabeth mine (VT), Rio Tinto mine (NV), Nacimiento mine (NM), Wildcat mine (KY) and the Leviathan mine (CA).

Representative Project Experience

Project	Description
Ionic Water Technologies, Inc. **Leviathan Mine Superfund Site** Mr. Doug Carey, Lahontan Regional Water Quality Control Board, South Lake Tahoe Mr. Kevin Mayer, USEPA Region 9, San Francisco	TKT has performed project planning, design, construction oversight, water treatment system operations, Sludge management and removal, formulation of plans and reports; and TAC meeting participation and presentation. This work includes water treatment at all of the current treatment system locations. Tim Tsukamoto was contracted to the Lahontan Regional Water Quality Control Board for Bioreactor design and treatment at the Channel Underdrain and the Aspen Seep. **In 2005, 2006 and 2011, TKT was contracted to conduct emergency treatment of Pond Water using a mobile RCTS based system very similar to the system proposed herein and successfully treated and discharged water, while preventing untreated water from entering Leviathan Creek and meeting discharge objectives.**
Ionic Water Technologies, Inc. **Elizabeth Mine Superfund Site** Mr. Ed Hathaway, EPA Region 1, Boston, Massachusetts Mr. Scott Acone, P.E., PMP US Army Corps of Engineers, Concord, Massachusetts	Tim Tsukamoto, while with Ionic Water Technologies provided conceptual design, startup and operations support to the US Army Corps of Engineers and the Environmental Protection Agency through a subcontract to Weston Solutions. The system was chosen for the project to treat acid mine drainage at the remote and historic copper mine. The RCTS-based system treated 40% higher flows than anticipated, while utilizing a proprietary calcium oxide feed grinder and slaker system as an inexpensive alternative for lime delivery. The RCTS based treatment system was installed in 2008 and is still treated water to EPA's prescribed discharge objectives.
Ionic Water Technologies, Inc. **Landusky Mine Superfund Site** Mr. Wayne Jepson, Montana Department of Environmental Quality, Helena, Montana Mr. Peter Bierbach, Bureau of Land Management, Billings, Montana	Timothy Tsukamoto provided project management and design while with IWT for a fast track design of two lime precipitation systems to the State of Montana and the Bureau of Land Management at the remote Landusky Mine, in Montana. These SCADA controlled systems are designed to operate in the harsh conditions of northeastern Montana. IWT provided design, equipment acquisition, construction management, start-up and on-going consulting.

Operational Communications

Operational communications are designed to facilitate safe and efficient work and movement at the Site. TKT staff will have direct communications capability using hand-held radio units, cellular telephones, and satellite phones, as required. TKT will have primary responsibility for Site communications.

Emergency Communications

Emergency communications are designed to alert emergency responders in the event of an emergency (including but not limited to property damage, vandalism, trespass, personal injury, fire, and hazardous material spill). TKT will maintain cellular/satellite telephone contact onsite during field work. In the event of an emergency, Site personnel will immediately implement an emergency response plan, notifying the appropriate emergency responders. The on-site safety coordinator will report the incident/accident as specified in the SHSP as soon as safely possible after initiating emergency response.

Site Safety

Worker safety will be a primary concern throughout the project. Site workers will be required to adhere to safety procedures outlined in the SHSP. All TKT field personnel will be in compliance with Occupational Safety and Health Act (OSHA) 1910.120 for hazardous materials operations. A tailgate safety meeting will be conducted prior to initiation of on-site activities each day. The tailgate safety meeting will identify activities planned for the day, required personal protective equipment (PPE), chemical, physical, and biological hazards posed by equipment and environmental factors and the work practices necessary to mitigate these hazards, and emergency response procedures. Special emphasis will be placed on specific emergency protocols (emergency response system notification, first aid procedures, egress, and route to the nearest medical aid) in the event that an accident or injury occurs at the Site. All Site workers will be required to participate in the daily tailgate safety meeting. If a worker is not onsite at the time of the meeting, TKT will provide the worker with a safety meeting summary.

Safety

TKT does not anticipate the use of subcontractors for this emergency response. However, should sub-contractors be utilized they will comply with all safety requirements set forth in applicable State, Federal and local laws and regulations. The Subcontractor shall ensure that all its employees perform the work in a safe manner by conforming to the Subcontractors and ER's Health & Safety Plan.

Site Access and Security

Access to the Site during field activities will be controlled in order to maintain worker safety at the Site. During the field work, TKT will maintain a command post at the proposed location of the rotating cylinder treatment system (RCTS™) treatment system. During mobilization a designated vehicle will operate as the command post. The command post will maintain emergency instructions (including telephone numbers, Site location, and hospital route map), the SHSP with associated Hazcom, material safety data sheets (MSDS) and sign in/out sheets as a record of all Site visitors and workers. The sign-in/out sheets will be clearly posted, and will require Site visitors and workers to state their onsite activities, time in, and time out. All Site visitors and workers will be briefed on field activities and Site safety procedures prior to entering the work area. All proposed visitors are required to have written permission from an appropriate party in order to access the Site.

Site Preparation, Use, Maintenance, and Permits

In order to ensure worker safety and environmental protection, specific work areas and practices will be developed prior to activities. Work areas will include a command post, treatment system containment area, an equipment fueling/maintenance area and a parking area. Site entry and exit areas and traffic patterns will also be identified. The command post will be near the proposed location of the RCTS™ treatment system containment area. A parking area for vehicular traffic (worker and visitor vehicles) will

be established near the command post. An equipment fueling/maintenance area will be established in the same vicinity, predominantly for the fueling and maintenance of generator systems. Decontamination areas will be identified and established onsite, if necessary.

Due to the timing of the project, the client or the EPA will be responsible for any permits that may be required.

The locations of specific work areas described above are subject to change upon arrival and inspection of the Site prior to beginning field work.

Equipment and Materials

Equipment and materials will be brought to the Site to provide water treatment. Equipment will include 18 wheeler delivery vehicles, light and medium vehicles, machines, and tools required to mobilize, install, and operate the RCTS™ treatment system. Use of the following equipment and materials are anticipated:

- Grade-all All Terrain Forklift – Mobilization, Equipment Unloading
- Diesel Generator(s)
- Diesel Fuel
- Water Pumps and Piping
- Lime Delivery System
- Hydrated Lime
- RCTS™ Treatment System
- Sludge Bins and Bags
- Light and Medium and 18 Wheeled Vehicles and Trailers (Materials, Equipment)
- Electrical Components and Wiring
- Heat Trace, Insulation, and Cover (if necessary)
- Portable generator for operation of standard hand tools
- Standard hand tools
- Appropriate PPE

Equipment which has the potential to start a fire will be equipped with a fire extinguisher (UL rated 2-A/10-B-C). A shovel and an axe or Pulaski will be located at the command post. Equipment and materials brought to the Site to perform the field activities will be inspected and approved as required. TKT will facilitate such inspections in order to prevent project delays.

Proposed Treatment Plant

A description of the proposed treatment system is provided below and diagrammed (Figure 1). The proposed treatment plant is a mobile emergency response treatment system primarily owned by TKT Consulting. This system is very effective at treating water of this type, and could be converted to a more permanent automated system that can treat through the winter if the capital outlay is either provided by the client or is funded up front as described above.

The proposed emergency response system consists of the following components:

1. Pad- A 120' x 60' leveled pad for the system (plus sludge dewatering 40' x 140') will be necessary to place the treatment system.

2. Grinder Pumps- One TKT lime grinder slurry pump for feeding lime slurry and a redundant pump.

3. Lime slurry storage tanks- Three to five lime slurry storage tanks complete with mixers to contain hydrated lime slurry.
4. Lime dosing tank- A lime dosing tank complete with mixer to adjust system influent pH.

5. RCTS™ system- Two RCTS™-60HS unit with 500 gallon capacity and capability to handle a flow of 300 gpm each. The RCTS™ unit will provide aeration for oxidation of iron and manganese and dissolution of the lime added for neutralization.

6. RCTS™ capture and pumping station- A tank will collect gravity fed effluent from the RCTS™ units and will pump the treated water to the filtration system.

7. Filtration and dewatering bins- Roll off bins for sludge filtration and dewatering

8. Controls – System will be equipped with controls to allow the system to run unmanned overnight.

9. Generators- Diesel generators will be utilized to supply power to the system

TKT has implemented several treatment systems that operate through the winter months. The difficulty with this project is the amount of time available before winter. TKT believes that the following option is viable assuming the following winterization components can be constructed in time. If the client choses to winterize the system as discussed, the Full Scale Interim Water Treatment Plant will consist of the following components:

1. Pad- A 250' x 800' leveled pad will be necessary to place the building which contains the treatment system. A semi-flat area will also be required for parking and deliveries.

2. **Building- A heated building will be required to prevent system freezing.**

3. **Dry Lime Hopper- A dry lime hopper and feed system will be utilized to add lime to make slurry. (Dry lime can be hand fed to produce slurry for the system as a backup)**

4. Lime Slurry Delivery Pumps- One lime slurry pump for feeding lime slurry and a redundant pump.

5. Lime slurry storage tank- A lime slurry storage tank complete with mixer to contain hydrated lime slurry. System will also include separate manual feed lime slurry tanks as backup.

6. Lime dosing tank- A lime dosing tank complete with mixer to adjust system influent pH.

7. RCTS™ system- **Three** RCTS™-60HS unit with 500 gallon capacity and capability to handle a flow of 300 gpm each. The RCTS™ unit will provide aeration for oxidation of iron and manganese and dissolution of the lime added for neutralization.

8. RCTS™ capture and pumping station- A tank will collect gravity fed effluent from the RCTS™ units and will pump the treated water to the filtration system.

9. **Flocculent Make-up system. An automated floc makeup and delivery system will be utilized to promote better flocculation and filtration of solids**

10. Filtration and dewatering bins- Rolloff bins for sludge filtration and dewatering (A total of 10 dewatering and filtration bins will be housed within the building. This number of bins increases building size but will allow for the sludge to be dewatered more thoroughly and will require less frequent disposal. ER will provide and remove/replace containers as required.

11. Controls – System will be equipped with controls to allow the system to run unmanned overnight.

12. **Generators- Two propane or natural gas generators will be provided to power the system and add redundancy**

13. **Fuel tank- A fuel tank will be provided to allow the system to run with weekly delivery of fuel.**

Photos of RCTS Mobile Emergency Treatment Systems

Emergency Treatment at the Leviathan Mine using a mobile RCTS System.

Emergency Treatment at Swift Gulch (Landusky mine)

Mobile Treatment System for Treatability Study (Gladstone)

Diagram of Proposed Emergency Treatment Plant

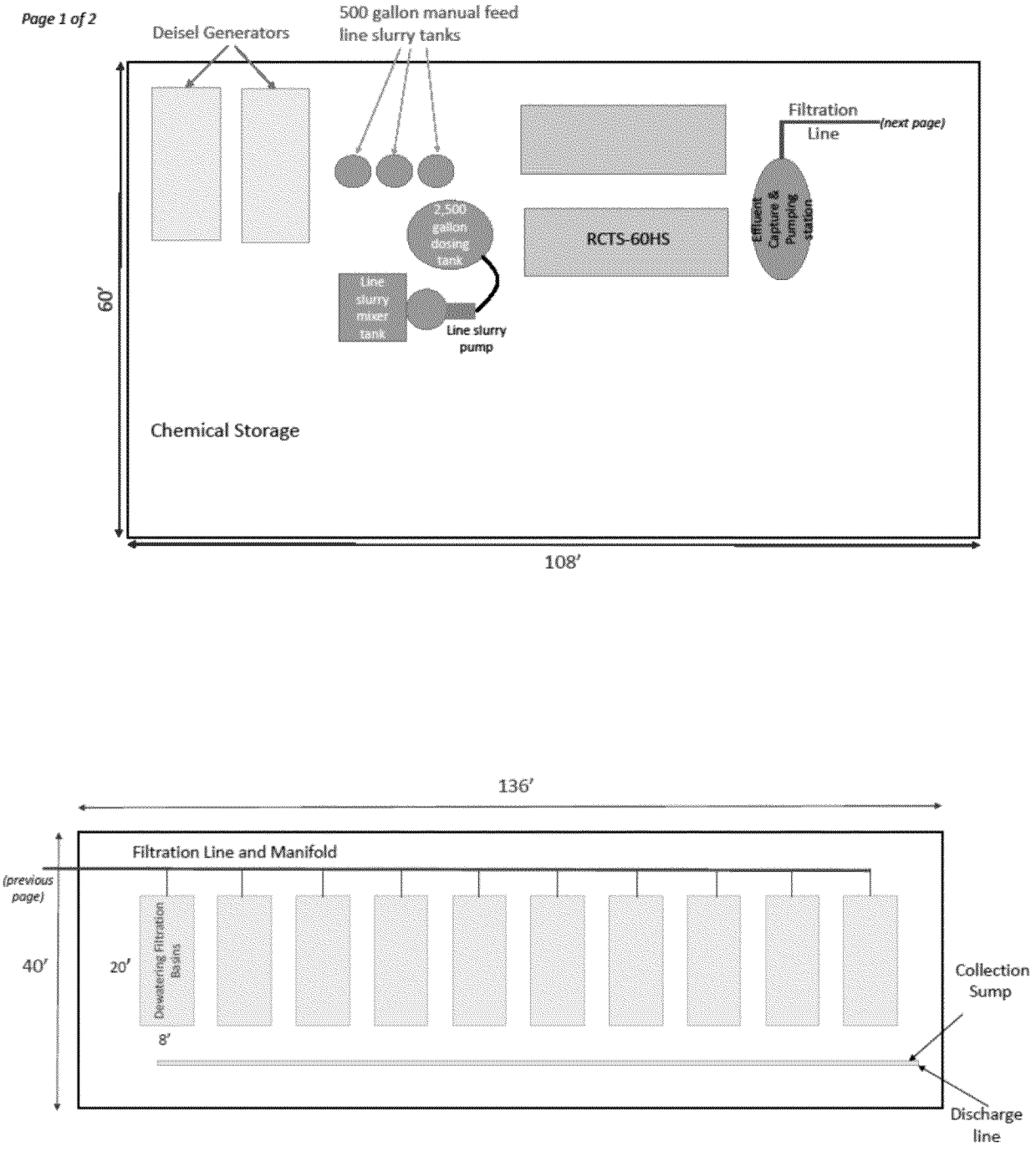
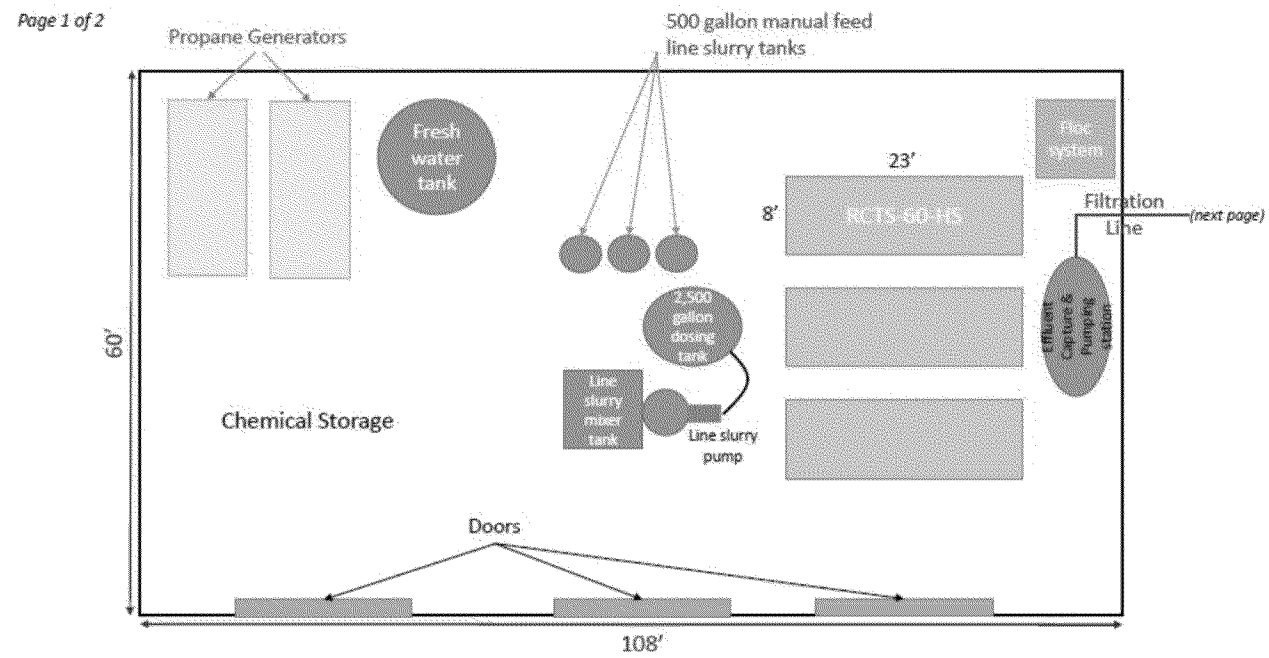
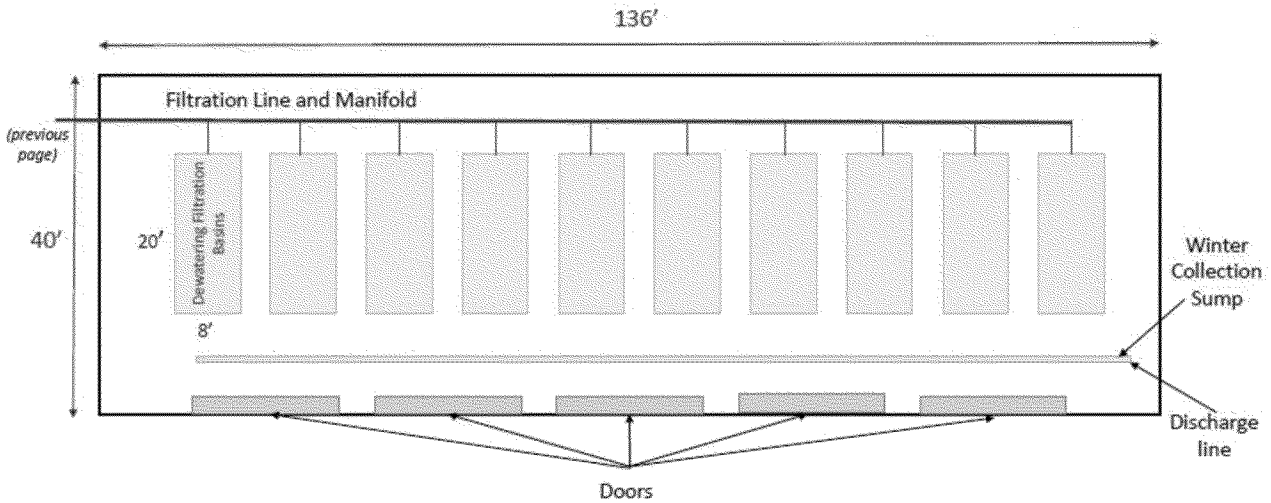


Diagram of Proposed Winterized Treatment Plant with Buildings and Upgrades





RCTS™ Technology

The Rotating Cylinder Treatment System™, (RCTS™), is the aeration/oxidizing and mixing component of this lime precipitation system. It is typically utilized in conjunction with a lime delivery system and a solids separation system. RCTS™™ was originally developed to treat highly concentrated water with high oxidation demands. The Rio Tinto Mine in Northeast Nevada which generated acid mine drainage with 5,000 to 7,000 mg/L of reduced iron, provided a testing ground for various configurations and prototypes of the RCTS™. The systems manufactured today are field-proven to meet the demands of mild freezing temperatures, acidic waters, high sulfate and metal loading, and continuous automated operation.

The RCTS™ aeration concept is different from traditional aerations system. Rather than injection of air into water, (which is inherently limited by the amount of oxygen in air) RCTS™ introduces water to air in a thin film clinging to the rotating perforated cylinder. This unique system of aeration replicates natural aeration and eliminates the need for costly compressors and blowers. In addition to the low energy consumption this system requires less maintenance due to scaling, when compared with alternative aeration technologies.

Metals Precipitation and Treatment Process

Metals are generally precipitated as hydroxides, sulfides or carbonates in water treatment. Our thorough understanding of water chemistry allows us to select the most appropriate treatment process based on the chemistry of the constituents of the particular water of concern and the site conditions. For those metals that are removed effectively as metal hydroxides/oxides we can harness the great aeration and mixing efficiency of the RCTS™ to precipitate the metals and remove them from solution. Lime will be utilized as the source of alkalinity because of its low cost, its ability to remove sulfate, and because it does not add ions detrimental to soil such as sodium. This process increases the pH of the contaminated water and oxidized metals which facilitate the precipitation of dissolved metals as particulates.

RCTS™ System Advantages

Lime Efficiency

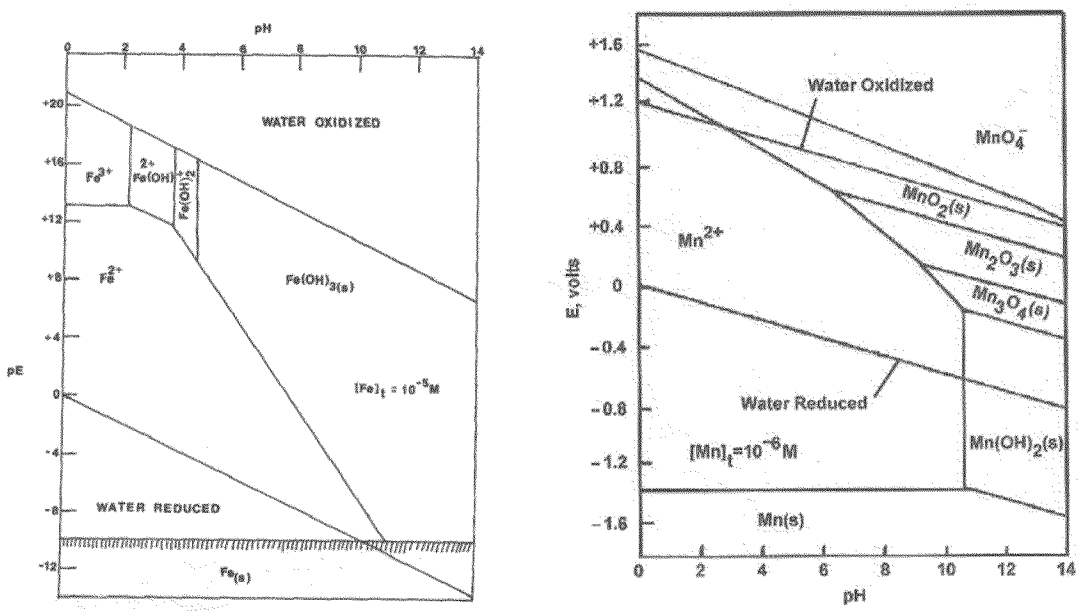
Most traditional lime treatment systems do not efficiently utilize all of the lime added for alkalinity. This occurs because lime is inherently insoluble and is delivered in slurry. As the lime is added the precipitated metals coat the surface of the lime particles and trap unutilized lime within the particle. The RCTS™ system produces near 100% lime utilization on most sites due to the aggressive mixing and sheer forces present in the containment. Two benefits arise from this: 1) lower lime consumption due to the utilization of all of the available alkalinity in the introduced lime, and 2) less sludge production resulting from less lime usage per unit of alkalinity required. Results on other TKT projects have demonstrated a 31%-51% reduction in lime usage and reduced sludge production when compared to traditional lime treatment systems. This will save the client money upfront on lime costs, require less capital for filtration/settling and will save money on sludge removal.

Manganese and Iron Oxidation Specific to RCTS™ Technology

The effectiveness of the RCTS™ at aerating and oxidizing metals allows TKT to precipitate iron and manganese at a lower pH than conventional systems. This often results in a single stage, flow-through system where conventional systems must treat in multiple stages.

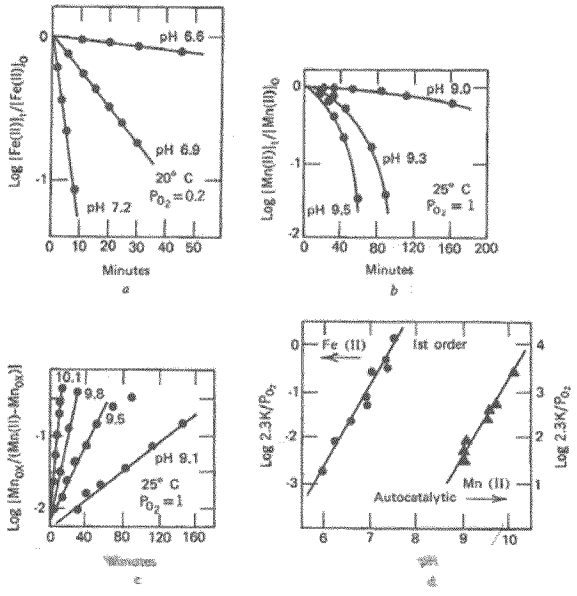
The oxidation efficiency of the RCTS™ is clearly demonstrated by manganese and iron oxidation in AMD waters. In order to precipitate dissolved manganese and iron from the water the pH must be increased and the reduced manganese and iron must be oxidized. Figure 2 displays the pH dependence of manganese and iron precipitation. From this graph we can deduce that the pH must be increased to precipitate iron and manganese from solution. In addition, if the manganese and iron is oxidized a lower pH is required.

Figure 2. pH-pE Stability Diagrams for Iron and Manganese



The rate of oxidation is also enhanced at higher pH. Figure 3 displays the correlation of pH to the rate of oxidation for iron and manganese. The oxidation time needed for manganese removal at pH 9.5 is typically on the order of 60 minutes. TKT has demonstrated manganese oxidation and removal from 19-26 mg/L to less than 0.08 mg/L at pH 9.75 with less than 2 minutes residence time with the RCTS™ system.

Figure 3. The Effect of pH on Oxidation Rates for Iron and Manganese



Chemistry Specific to the Site

ER provided a data set of the chemistry of the water to be treated. The data indicates that the acid mine drainage from the source is moderate in strength when compared to other sources of acid mine drainage. The pollutants of concern are aluminum, arsenic, cadmium, copper, iron, lead, manganese, nickel, zinc, and pH.

Given the chemistry specific to Gold King, if the pH is increased to a value of 9.0 su we can expect more than 98% of the dissolved aluminum, arsenic, copper and zinc will be precipitated. At this pH greater than 98% of the iron will also be precipitated due to the aeration and mixing that is provided by the system. It is expected that more than 95% of the cadmium will likely co-precipitate at this pH due to the relatively high iron concentrations. In our experience the pH must be increased to at least 9.75 su. in order to precipitate manganese effectively with little residence time, at this pH TKT estimates that the manganese can be precipitated and concentrations reduced to less than 5 mg/L of dissolved manganese with 2 minutes residence time in the RCTS™.

Lime Requirements

The proposed system is designed to achieve a lime efficiency of greater than 80% at 500 gpm, and greater than 95% at 200 gpm with extended residence time in the RCTS™ unit. The exact efficiencies will be determined during startup and optimization. Conventional systems with mixers and bubble diffusers are typically 50-70% efficient and will consume more lime and generate more sludge.

According to the data provided in the RFP, the acidity is ~700 mg/L $CaCO_3$. This equates to 604 mg/L of acidity as $Ca(OH)_2$. At a flow rate of 500 gpm, TKT estimates that ~3650 lbs of $Ca(OH)_2$ will be consumed per day, assuming 90% efficiency. At 200 gpm TKT estimates 1390 lbs of $Ca(OH)_2$ will be consumed per day assuming 95% lime efficiency.

Sludge Generation

TKT systems typically utilize greater than 95% of the lime that is added for neutralization, particularly with extended residence times. Therefore, the resulting sludge consists mainly of a combination of metal oxides/hydroxides and gypsum. This result in a lower mass of sludge produced because the sludge is essentially void of unreacted lime. Conventional systems will leave as much as 30% to 50% of the lime unreacted.

The exact volume of sludge that will be generated is unknown until the system can be tested. However, using the metals data provided (there was no sulfate data provided so a removal of 500 mg/L as gypsum is estimated) and at a treatment rate of 500gpm TKT estimates that ~137 Kg of metal hydroxide/oxide and gypsum precipitate will be generated per hr. If this sludge is dewatered to achieve a dry bulk density of 0.2 g/cc, it will generate ~600 ft^3 of sludge per day. If the sludge can be stored on site and dried further, this would significantly decrease the volume of sludge to be hauled off. TKT estimates that with an onsite sludge drying basin a dry bulk density of 0.5 g/cc or greater could be achieved based on experience at the Leviathan Mine. TKT estimates that a conventional system would generate as much as 30%-50% more sludge and would require a larger sludge dewatering system.

Project Schedule

The following schedule assumes that a mobile emergency response treatment system will be mobilized and eight weeks of treatment will be provided if deep freezing conditions do not stop treatment.

The schedule is outlined:

- Contract Award and deposit of $
- Mobilization, installation and system start-up – 21 days (3 weeks)
- Eight weeks of operation
- Demobilization or winterization

Site Transition / Mobilization

TKT will coordinate transition of the Site from ER's system to the Interim Water Treatment System, as necessary, with representatives of ER and EPA to ensure a seamless transition in treatment system operations.

Decontamination Procedures

Prior to mobilization, equipment used onsite will be inspected to prevent introduction of noxious weeds to the Site. Equipment that has come into contact with potentially contaminated soil will be decontaminated upon completion of field work, prior to demobilization. Equipment will be decontaminated onsite by removing large clumps of soil or debris. Any fluids used for decontamination are not anticipated to contain significant concentrations of heavy metals, and will be allowed to infiltrate into the ground at the decontamination area.

Health and Safety Plan

TKT will provide a Health and Safety Plan prior to beginning site work including any construction activities, and a Contingency plan including a Spill Prevention, Control and Countermeasures Plan, Pollution Prevention Plan prior to placing chemicals on the site.

Mobilization

Mobilization of equipment and materials assumes that the road will be maintained and accessible by all delivery equipment. In addition, continuous maintenance of the access road to the plant and the immediate area surrounding the site will be required.

It is anticipated that mobilization of treatment system components will be achieved through the use of 4 wheel drive light vehicles, medium weight vehicles (sludge bin delivery, lime delivery), bumper tow trailers, and 18 wheelers. An all-terrain Grade-all forklift will be utilized to unload equipment.

System Installation

System Installation for the mobile emergency response treatment system will begin after sufficient equipment and materials have been safely transported to the Site.

Gold King Capture and Conveyance

This proposal assumes that the capture and conveyance system will be installed and maintained by ER. ER will convey the water to the system via 6" HDPE redundant lines at a pressure specified by TKT.

RCTS™ Treatment System Installation

The RCTS™ treatment system will consist of lime slurry storage tanks, lime slurry pump(s), a pH dosing tank, pH probes and controllers, motor control, electrical system disconnect panels, RCTS™ units, RCTS effluent capture and pumping station, filtration/dewatering bins, and piping.

Diesel generators will be installed as close as safely and reasonably possible to the treatment system.

A narrative description of the Treatment System follows:

- Lime Slurry Storage Tanks and Mixers
  Lime slurry will be mixed by hand using hydrated lime in 50 lb. bags. Initially influent water will be used to mix the lime slurry, after treatment begins, RCTS™ effluent will be used to mix the lime slurry. A "T" and valve will be installed in the system effluent water pipe just after the effluent capture tank

submersible pump which will allow transfer of water to the lime slurry tank for the purposes of slurry make-up. It is the goal of the treatment system design to store and mix lime slurry at a concentration to facilitate continued treatment for a 24 hour period. The lime slurry tanks will be constructed of HDPE having 500 gallon capacity. A valve and flexible high pressure hose will be installed at the base of the tank for transfer of lime slurry to the slurry pump. For tank fill, the flexible line will be disconnected from the grinder and the fill line then connected which will clean the lime supply line while filling the tank. Mixer mounts will be installed on the top of the lime slurry storage tank. The lime slurry tank mixer will use a 480V 3 phase, properly guarded and grounded motor designed for use in a tank of this volume and type. The mixer will provide continuous agitation and suspension of lime slurry. The mixer will be controlled through Hand, Off, Automatic (HOA) switches and controls located in the Motor Control Panel (MCP).

- Lime Slurry Pump – Lime Delivery System

  A Lime slurry Pump will be used for the conveyance of lime slurry from the lime slurry storage tank to the pH dosing tank. A second pump will be on hand for redundancy. A Grinder Pump may be utilized to reduce clogging associated with lime scale. If more than one slurry tank is utilized a 2-inch, high pressure hose valve will be connected to the slurry tank bulkheads. The lime slurry manifold will be built in such a manner as to be serviceable for the purposes of cleaning and maintenance. The manifold will utilize valves to allow continuous operation of the treatment system during the lime slurry make-up process. The slurry pump will cycle on and off according to signals received from the output relay of the pH controller to maintain the treatment target pH in the dosing tank. Pump power will be provided through HOA switches and controls located in the MCP.
- pH Dosing Tank and Mixer

  A 2,400-gallon vertical open top tank constructed of HDPE will be used as a pH dosing tank. The dosing tank will be installed reasonably close to the RCTS™ units and lime slurry storage tank, allowing access and egress. Influent water pipes will enter at the top of the tank and be secured to the mixer mounting bracket to prevent siphoning from occurring in the event of a system upset. Influent water will be mixed with lime slurry to the prescribed treatment pH and gravity flow from the dosing tank to the RCTS™ units. Flanged tank bulkheads, pipe, and connections will be constructed of schedule 80 PVC. A mixer mounting bracket will be installed to the top of the tank which will support a 480V 3 phase mixer which will maintain consistent agitation in the tank. The dosing tank mixer will be controlled with an HOA switch on the MCP.
- pH Probes and Controller

  The lime delivery system will be pH controlled. A submersible pH probe will be installed at the top of the dosing tank near the outfall flow to the RCTS™ units. The probe will send a 4-20mA signal to the controller located in the command post. The pH controller output relay will control the operation of the lime grinder pump at the MCP.
- RCTS™ Units

  Two RCTS™-60HS units will be installed for aeration/oxidation and lime mixing. Schedule 80 PVC piping and flange tank bulkheads will be installed and will allow gravity flow from the dosing tank to the RCTS™ units. Each RCTS™-60HS unit has a hydraulic capacity of 500 gallons and water levels in the RCTS™ units are maintained with a stand pipe inside the RCTS™ containment at the effluent end of the system. Schedule 80 PVC piping and flange tank bulkheads will be installed to allow gravity flow from the RCTS™ units to an effluent capture sump. Each RCTS™ unit will utilize 2 – 10hp 480 V 3 phase electric motors and gear reducers. The RCTS™ drive motors will be operated by HOA switches located in the MCP.
- RCTS™ Effluent Capture Basin, Pump, and Piping

  The effluent from the RCTS™ units will be pumped to sludge bins. Schedule 80 PVC pipe, flange bulkheads and fittings will provide gravity flow from the RCTS™ units to the capture sump. Level control or floats will be installed in the sump to pump water to the filtration bins. The effluent capture basin pump(s) will be 480 V 3 phase and will be controlled by an HOA switch at the MCP. A trough heater may be installed in the effluent capture basin to help prevent freezing.
- Sludge Bags and Bins

  Sludge bags (geo-textile bags or liners) and dewatering roll-off bins will be utilized for the separation and capture of sludge from treated water. The bins will be installed to allow access for delivery and removal of bins. Sludge bags typically have a flange which will be connected to the conveyance line from the treatment system effluent pump. Water will be conveyed from the sludge bins to discharge.

Generator Installation

Diesel generator(s) will be used for power generation at the Site. The initial power demand of the emergency response system will be less than 100 KVA. Two generators will be installed to provide redundancy for the system. The generators shall be installed and maintained according to manufacturer's specifications. The generator will be fueled by the service truck on site. A transfer switch will be installed to provide back-up power generation in the event of a generator failure.

Heat Trace and Insulation

Piping in and around the treatment system will be heat traced and insulated if necessary to prevent freezing (no amount of heat trace will prevent freezing if deep freezing conditions are encountered). Heat trace and insulation will be installed according to manufacturer's specifications. Heat trace and insulation will be installed after the piping has been checked for leaks and deemed operationally sound.

Start-Up and Optimization

Start-Up

Start-up will begin with a quality control and assurance review of the treatment system installation. All aspects of the treatment system will be inspected and tested, as required, to assure proper operation. The start-up inspection will include but is not limited to:

- Visual inspection of all tanks and piping for leaks and abnormalities
- Visual inspection of RCTS™ units for leaks and abnormalities
- Inspection of the electrical system to confirm proper installation and operation of all electrical components
- Calibration of any level transducers, and pH probe and controller to manufacturer's specifications

Optimization

Historical data from previous treatment at the Site utilizing RCTS™ technology will be reviewed and used as a baseline for the beginning of the optimization process. Due to the simplicity of the system, the optimization process is not expected to take more than one week. Additional time will be necessary to optimize sludge filtration. A testing protocol will be established for the following optimization parameters:

- Identify and establish treatment system operational pH
- Primary TKT field HACH testing
- Optional TKT AA operational sampling
- Certified lab analysis
- Determine aeration/oxidation (residence time) requirements
- Identify operational lime slurry concentrations and lime efficiencies
- Evaluate sludge capture effectiveness

Through the use of historical data and field measurements, TKT will identify and establish the operational pH of the treatment system. The operational pH of the system is anticipated be at or near a pH of 9.0. The testing protocol will sample system effluent at various pH levels and flow rates to establish the system target pH.

Samples from optimization testing will be analyzed in the field using HACH 2800 field equipment. TKT will utilize a handheld YSI 556 for field measurements of temperature, pH, dissolved oxygen, specific conductance, and oxidation reduction potential (ORP).

TKT operational analysis and sampling may be performed to confirm field data prior to or concurrent with the beginning of operational treatment.

TKT will determine the system residence time required for aeration/oxidation of the water to be treated. Oxidation requirements are a limiting factor in the treatment of the reduced waters, this optimization testing will help determine how high the pH must be raised.

TKT will evaluate and identify a lime slurry concentration for treatment operation. There are two objectives for this evaluation: (1) to limit worker exposure to hydrated lime through engineered slurry storage capacity; and (2) to maximize lime efficiency and reduce sludge production and system fouling.

TKT will optimize the sludge capture system by identifying the maximum flow rate that can be achieved in each bag and bin while effectively removing sludge.

TKT will optimize the system to meet to the extent possible the "Desired Effluent criteria" that are listed below.

- Near neutral pH. It is expected that the operating pH will be between 8.0 and 9.5. (It is not expected that upsets will occur but due to the emergency nature of the project and time limitations safeguards such as a buffering pond cannot be implemented. Therefore an upset in the system could result in release of water that is not neutralized)
- Remove dissolved and total solids/ remove metals. TKT expects that dissolved metals will be removed in excess of 95%. Based on experience from multiple sites with similar chemistry TKT expects the system to meet discharge requirements for most if not all of the metals even with this single stage treatment. A relatively high target pH will be evaluated to determine how much aluminum removal will remain dissolved. Precipitated metals will be removed to the extent possible with the filtration system in place. Once filtration bags are seasoned, it is expected that more than 80% of solids will be filtered out. It is not expected that sulfate concentrations will be reduced to less than 1600 mg/L.
- Eliminates any color. The filtration system will be designed to filter out the precipitated solids. It is not expected that 100% of the color will be removed. Filling multiple bins at the same time will reduce flow rates through the filters and should reduce the amount of solids passing through the filters. A finer filter may be added to polish the effluent further.
- Obtain high percent reduction of constituents within leachate. See above
- Operate without upsets. Redundancy is added to the system to reduce the chance of upsets. The following items will have redundancy:
    1. Power. Two generators will be utilized
    2. pH control. A second pH controller and probe will be maintained on site.
    3. Lime feed. Redundant slurry pumps will be maintained on site
    4. RCTS™. Two RCTS™ units will be untiled to provide redundancy
    5. Effluent pumps. Effluent pumps will be installed to discharge effluent to the filtration bins
    6. Filtration Bins. Up to 10 filtration bins will be utilized to provide filtration redundancy
- Treat flow rates from 200 to 900 gpm. The two-unit emergency system will treat flow rates up to 600 gpm
- System must be self-contained. Generators will be contained to prevent minimize the chance of a diesel spill occurring. Lime will be the treatment chemical that is utilized and slurry tank capacity will be less than 2500 gallons total. Even if all five tanks were to spill at once releasing the entire volume of lime, it is doubtful it would reach Cement Creek. Even if it did, it still would not be enough lime to neutralize the low pH creek so a spill would actually result in better water quality in Cement Creek.

Treatment

Treatment will begin after start-up and optimization have been completed. TKT will supply personnel qualified to meet the stated requirements for all aspects of working at the Site, (see HSP at Attachment A). Treatment operations will include but may not be limited to:

- Tailgate safety meetings, documentation, and record keeping
- Treatment system visual and operational inspections
- Treatment system maintenance

- Lime slurry make-up
- Monitoring and reporting
- Sample collection
- Coordination with ER of sludge handling, transportation, and disposal

All work will be conducted in accordance with applicable regulations. Personnel are required to wear appropriate PPE as detailed in the HSP. TKT will provide weekly operational reporting which will detail field work performed.

Treatment system visual and operational inspections and associated maintenance will be performed on each day that personnel are required to be onsite. Inspections will be documented and recorded accordingly.

Lime slurry make-up will be an integral part of treatment system operations and is a top safety concern. As such, personnel will be trained to safely mix the lime slurry. On-site personnel will wear appropriate PPE as mandated in the HSP and will adhere to the lime slurry make-up process checklist at all times.

A monitoring plan will be developed during the start-up/optimization phase of the project which will identify treatment system monitoring points. Daily monitoring duties will include but may not be limited to:

- Operational conditions at the Site, (weather, safety)
- Influent flow totals and rates
- Field parameters (untreated)
- Lime slurry volume and use rate
- Diesel volume and use rate
- Generator daily inspection
- pH probe drift check and calibration
- Individual RCTS™ unit field parameters (RCTS™ effluent)
- Sludge bag and bin volumes and capacities
- Sludge bag and bin effluent water field parameters
- Discharge field parameters at prescribed intervals

Monitoring information will be recorded on field forms and in field notebooks, and will be summarized in weekly operational reporting.

During normal operations it is expected that the system can be maintained and operated by two to three employees over an 8-14 hour shift. System upsets, due to equipment malfunction or other emergency situations may require longer shifts and or more personnel on site.

Laboratories and Sampling

Certified samples will be taken by TKT employees every two weeks at the system influent and discharge to monitor system influent and performance. Certified samples will be sent to Energy Laboratories in Billings, MT. Samples will be analyzed for total and dissolved metals (Al, As, Cd, Cu, Fe, Pb, Mn, Ni & Zn), sulfate, acidity, alkalinity, hardness and pH. Non-certified operational samples may also be taken on alternating weeks and as needed to help with system optimization. Operational samples will be sent to TKT's lab in Reno, NV. Samples will be analyzed for total and dissolved metals (Al, Cu, Fe, Mn, Ni & Zn) and sulfate.

Reporting

Field Notes and Logbooks

Field personnel will record all information pertinent to the system in a field logbook. The field logbook will be water-resistant, and all entries will be made in indelible ink. Logbooks are accountable field documents and serve as a chronological representation of the sampling program. Sufficient detail will be included in

the logbook to summarize sampling and field measurement activities without relying on the recorder's memory. Examples of typical field logbook entries include the following:

- Personnel present
- Daily temperature and other climatic conditions
- Field measurements, activities, and observations
- Referenced sampling location description (in relation to a stationary landmark) and maps
- Sample collection methods and equipment
- Date and time of sample collection
- Sample identification and cross-referencing
- Sample types and preservatives used
- Analytical parameters
- Sampling personnel
- Site sketches
- Visitors to the Site

Daily Progress meetings

Daily progress meetings will be held on site to discuss the following topics:

- Current project status and schedule;
- Impacts to schedule;
- The agreed program of future work, including the subcontractor's proposed action to complete the work on time; and
- Actions to be taken to remedy delays.

Weekly written reports (via email will be required to be submitted to ER).

Cleanup

TKT shall at all times keep the construction area free from accumulations of waste material or rubbish resulting from his work. Upon completion of the work, TKT shall remove from the vicinity of the work and haul all rubbish, trash, garbage, and construction debris to an approved disposal site. Additionally, the subcontractor shall remove from the vicinity all unused materials, and the like, belonging to the subcontractor or used under the subcontractor's direction during construction.

Sludge Management and Disposal

Sludge from treated waters will be separated, contained, and disposed of through the use of filtration bags and dewatering bins. Bins will be allowed to dewatering for 2 to 6 days depending upon how well it dewaters by simple gravity drain. The sludge can then either be hauled off by ER as it is generated. This option will result in hauling sludge containing as much as 80% water.

An option that will enhance dewatering significantly will be to construct a dewatering pad to lay the filled bags onto and allow the bags to dewater further over the winter months. These bags will freeze and dry significantly. Based on experience at the Leviathan Mine, over the winter drying reduces the volume of sludge by as much as 60%.

Appropriate PPE will be worn at all times when handling treatment sludge.

Based on previous RCTS™ testing on site, it is not expected that the generated sludge will be classified as hazardous. Sludge generated during lime treatment should be tested and compared to federal hazardous waste characteristics by ER to determine whether they are hazardous. Regulatory threshold limits for determining if the treatment solids are hazardous are presented in Table 1.

Non-process Waste

All efforts will be made by TKT to minimize non-process waste generated during operations. TKT will dispose of such wastes in a manner to minimize clutter on site. TKT shall supply all spill containment equipment, safety equipment and materials required to comply with this statement of work.

Table 1. Treatment Solids Hazardous Characterization Limits

TREATMENT SOLIDS HAZARDOUS CHARACTERIZATION LIMITS	
Parameter	**TCLP Extract mg/L**
Al	NP
Sb	NP
As	5
Ba	100
Be	NP
Cd	1
Ca	NA
Cr	5
Co	NP
Cu	NP
Fe	NP
Pb	5
Mg	NA
Hg	0.2
Mo	NP
Ni	NP
Se	NA
Ag	NA
Ti	NP
V	NP
Zn	NP
Notes: TCLP – Toxicity Characteristic Leaching Procedure	

Demobilization / Site Transition

At the conclusion of the Interim Water Treatment, all treatment equipment and materials will be demobilized and a site transition may occur. This will be a coordinated effort between TKT and any parties involved in such transition.

Demobilization will be similar to the mobilization process with some exceptions. All equipment such as the command post and generators will be decontaminated and removed from the site.

Closing Remarks

TKT appreciates the opportunity to provide Environmental Restoration this proposal. **TKT believes that no entity can respond as quickly with specialized emergency response equipment and treat acid mine drainage as effectively with short notice. The preceding proposal is for emergency treatment only. Should you decide to extend treatment into the winter, we have provided two options. 1. Client provides a heated building and additional items described above to allow for winterization of the system; or 2. Client provides a down payment (amount to be determined) to allow TKT and subcontractors to construct the winterized system.** TKT is not willing or able to procure the bonds as set forth in the requirements in the RFP. This proposal reflects a best faith effort to respond to an emergency situation immediately. TKT does not believe that any of the proposed operations present a risk to the environment.

Additionally, TKT has provided what we feel is the most feasible winterized treatment system that can be implemented given the short time frame, remoteness of the site and difficult working conditions at high elevation in the fall months. This system will provide automated operation while still utilizing lime as the neutralizing agent rather than sodium hydroxide. Although we believe a silo feed system is more robust and will require less labor, we do not feel that is technically feasible without adding significant costs and this upgrade should be considered in the winter for installation in the summer of 2016.

Likewise, the solids removal and sludge dewatering system that is proposed is the most feasible and cost effective option to get treatment going quickly and remove a high percentage of solids throughout the winter months. It is expected that an unknown percentage of solids will pass through this collection system and its performance should be evaluated for long term solids removal. A more robust system using clarification and advanced sludge dewatering can be added on if necessary in the summer of 2016.

Given the high flows and loading, this site may be a candidate for a High Density Lime System (HDS) system. However, in order for an HDS system to operate properly and actually reduce the volume of solids generated, the water chemistry must be appropriate. The iron must be primarily in the ferrous form. This potential should be evaluated in the winter months to determine if a reduction in sludge generation can actually be accomplished with HDS. If testing proves viable then this option should be considered as an alternative. Because RCTS™ has been shown to reduce lime usage and reduce sludge volumes when compared with conventional treatment, there is a high probability that the proposed treatment will use less lime and produce less sludge than an HDS system that is treating like a conventional system due to the lack of proper chemistry.

It is imperative that access up to the doors of the treatment building be maintained continuously for delivery vehicles. If the system runs out of lime, treatment will essentially stop, if dewatering bins cannot delivered and removed, sludge removal will not occur and if the generators run out of fuel the entire system will stop and potentially freeze which could damage equipment. TKT cannot be held accountable for any system stoppages, delays or equipment damage resulting from the inability to access the site due to road conditions. The client will be responsible for damages to rented and TKT owned equipment should such an incident occur.

Upon acceptance, an insurance certificate will be sent, naming ER as additionally insured. I currently meet all of the requirements with the exception of the $5M umbrella requirement, which I will secure should TKT be awarded the contract. Should you have any questions or comments do not hesitate to contact us for clarification.

Tim Tsukamoto, Ph.D.
tkttim@gmail.com
(775) 846-9659

We look forward to working with you on this project.

Attachment A
GOLD KING INTERIM WATER
TREATMENT SYSTEM AND
PROPOSAL ACKNOWLEDGMENT

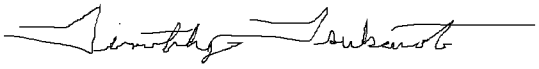
To:	Environmental Remediation LLC	From:	TKT Consulting, LLC
	1666 Fabick Dr.		2050 Driscoll Dr
	St. Louis, MO 63026		Reno, NV 89509
			(775) 846-9659

Site Name:	Gold King Mine Release GK8-77
Location:	Silverton , Colorado

The Subcontractor proposes to provide all equipment, labor, materials, and equipment necessary as described above and all attached drawings and specifications relative to the terms and conditions provided for the consideration of the bid prices provided herein on the pricing schedule.

The Subcontractor agrees they have examined the RFP and the extent of the scope of work, have examined the provided drawings, specifications, attachments, and examined and understands all existing local conditions relative to site access, hazards, labor, and any other conditions affecting, or which may be effected by, the scope of work.

(Signature) *(Date)*



8-26-15

Attachment B

SCHEDULE OF PRICING				
RFP# GK8-77-001				**Gold King**
ITEM	**DESCRIPTION**	**EST. VOLUME**	**$ PER UNIT**	**TOTAL**
1.0	Mobilization	Lump Sum	$293,977	$299,977
2.0	System Installation / Demonstration of Automated Operation	Lump Sum	$152,400	$152,400
3.0	Weekly Operations and Maintenance	Lump Sum	$36,600	$36,600
4.0	Demobilization	Lump Sum	$115,900	$115,900
5.0	Bond Costs	Lump Sum	$NA	$NA
6.0	Total Cost (Items 1, 2 & 4)			$568,277

Note: All charges, including up to five required onsite meetings for both superintendent and senior engineer, anticipated to be part of completion of the scope of work, should be included in the above bid. These charges include such items as all applicable taxes, license fees, handling fees, etc. TKT will provide weekly operations and maintenance for the duration of the proposed work for up to 8 weeks. This proposal assumes that all equipment for the job will be rented.

Company Name: TKT Consulting, LLC	Date: 8-26-15
Project / Technical Contact: Timothy Tsukamoto	Phone: (775) 846-9659
EPA ID #:	

Please refer to RFP# GK8-77-001 regarding correspondence to your quotation. Any questions please contact the representatives below. Bid Due date defined within RFP.

Submit Proposals to: Environmental Restoration LLC
1666 Fabick Drive
St. Louis, MO 63026
Attention: Jan Rick, Purchasing

636.680.2416 Phone
636.680.2466 Fax
E-mail to rfp@erllc.com

Attachment C
SUBCONTRACTOR IDENTIFICATION LISTING

11.1 Subcontractor List

Each bidder shall list in the form provided in Attachment C, (1) the name and address of each Subcontractor proposed to perform any portion of the work described under this Request for Proposal if the total amount of the work exceeds 10% of the total Contract amount, and (2) the portion of the work to be performed by each Subcontractor.

N/A

CURRICULUM VITAE

Timothy K. Tsukamoto

2050 Driscoll Dr. ♦ Reno, NV 89509 ♦ e-mail: tkttim@gmail.com
♦ Cell (775) 846-9659 ♦ Phone: (775) 786-5121

Education:

- Ph.D., Environmental Chemistry, University of Nevada, Reno, August 1999.
  Dissertation: Ethanol Enhanced, Passive Bioreactors for Treatment of Acid Mine Drainage.
- BS, Pre-med. (Biology equivalent), University of Nevada, Reno, December 1993.

Summary

I have over 29 years of experience working with the mining industry. I am recognized as an international expert in mine water treatment and prevention of acid rock drainage. The emphasis of my work is innovative treatment system design, optimization, operations and consulting. I have experience working with private mining, engineering and consulting and have also worked extensively with federal and state regulators. I have presented papers at the local, national and international level and have published over 40 technical papers and presentations.

Employment:

Principal Chemist: 6/02 to 1/07; 11/10 to present
TKT Consulting, LLC

- Design of chemical/biological systems for treatment of mineral mine drainage and wastewater
- Formulation of proposals and contracts
- Contract negotiations
- Environmental chemistry consultation
- Environmental monitoring
- Project management
- Regulatory reporting
- Project and proposal QA/QC
- Client base development
- Regulatory liaison
- Analytical laboratory services
- Characterization of metals sludge

Director of Science and Technology: 10/06 to Present
Ionic Water Technologies

- Design of chemical/biological systems for treatment of mineral mine drainage and wastewater
- Development and commercialization of innovative technologies
- Formulation of proposals and contracts
- Contract negotiations
- Environmental chemistry consultation
- Environmental monitoring
- Project management
- Regulatory reporting
- Project and proposal QA/QC
- Client base development
- Regulatory liaison
- Analytical laboratory services

Director: 12/04 to 12/07
Ionic Water Technologies

- Corporate planning
- Environmental chemistry consultation
- Technology research and development

Research Assistant Professor: 10/02 to 11/06
University of Nevada, Reno

- Formulation and development of grants and contracts through the States of Nevada and California, U.S. EPA, and private industry
- Treatment system design
- Project management
- Teaching of Analytical laboratory methods
- QA/QC Management
- Health and Safety officer

Post-doctoral Research Assistant: 8/99 to 10/02
University of Nevada, Reno

- Project management.
- Oversight and coordination of contractors and employees during construction and operation of treatment systems
- Development and technology transfer of "Dupont Passivation Technology"
- Formulation and development of grants and contracts through the States of Nevada and California, U.S. EPA, and private industry
- Technical assistance to U.S. EPA on multiple superfund sites

Graduate Research Assistant: 8/94 to 8/99
University of Nevada, Reno

- Design and management of field and laboratory water treatment systems with emphasis on low cost removal of metals, arsenic, sulfate and other contaminants.
- Contaminant and hydrocarbon analysis utilizing analytical techniques including GC, AA, IC and gravimetric, titration and spectrophotometric techniques
- Wetlands analysis
- Formulation and development of reports

Draftsman/Surveyor: summer 1993 & 2/94 to 8/94
High Desert Engineering, Elko, Nevada

- Water right, exploration drilling and mining claim surveying
- Civil Engineering, CAD

Awards

- Graduate Student Award in Environmental Chemistry, American Chemical Society, Division of Environmental Chemistry, 1998.
- Student Presentation Award, Best Student Poster Presenter, Eighth Annual NorCal Setac Meeting, NorCal Society of Environmental Toxicology and Chemistry, 1998.

Certifications

- MSHA surface miner
- OSHA 40 Hour HAZWOPR
- First Aid and CPR

Other Professional Activities

- DuPont/UNR Passivation Technology Team Member 2003-present
- Graduate Faculty Member, Environmental Sciences and Health, University of Nevada, Reno 2002-present
- Environmental Protection Agency: Technical Advisory Committee "Leviathan Mine" 1999-present
- Environmental Protection Agency: Technical Advisory Committee "Elizabeth Mine" 2002
- Environmental Protection Agency: Technical Advisory Committee "Rio Tinto Mine" 2002-2010
- U.S. Forest Service: Technical Advisory Committee "Colorado Hill" 2001-2004

Grants Received

"Remediation of Acid Mine Drainage at the Leviathan Mine" Lahontan Regional Water Quality Control Board, 2000-2001

"Use of Sulfate-Reducing Bioreactors to Remove Zinc in Mine Drainage" Placer Dome Corporation, 2000-2001

"Operation of a Bioreactor at the Leviathan Mine" Contract with Atlantic Richfield, 2000-2001

"Upgrade, Operation and Monitoring of Bioreactors at the Leviathan Mine" Contract with Atlantic Richfield 2001-2002

"Passivation of Acid Generating Rock at the Golden Sunlight Mine", Placer Dome Corporation 2002-2003

"Operation, Monitoring and Maintenance of Bioreactors at the Leviathan Mine" Contract with Atlantic Richfield 2002-2003

"Operation, Monitoring and Maintenance of Bioreactors at the Leviathan Mine" Contract with Atlantic Richfield 2003-2004

"Operation, Monitoring and Maintenance of Bioreactors at the Leviathan Mine" Contract with Atlantic Richfield 2005

"Operation, Monitoring and Maintenance of Bioreactors at the Leviathan Mine" Contract with Atlantic Richfield 2005

"Operation, Monitoring and Maintenance of Bioreactors at the Leviathan Mine" Contract with Atlantic Richfield 2006

Other Work

"Conceptual Design Virginia Water Treatment System", CH2MHill, 2012 to present

"Conceptual Design Rio Negra Treatment System" , Barrick S. A., 2012 to present

"Treatment of Mine Influenced Water at the Corona Mine". McCord Environmental, 2012 to present

"Technical Review of Proposed ARD treatment systems at the Thompson Creek Mine", JBR Environmental Services, 2012

"Startup and Testing of RCTS Lime Precipitation at the Lagunas Norte Mine", Barrick S. A., 2012

"Sulfate Removal at the Carson Hill Mine", Strategic Sciences and Engineering, September 2011

"Great Falls Coal Field Water Treatment Evaluation", Hydrometrics, July 2011

"Bench Testing and Treatment at Two South American Mines", Barrick S.A., May 2011

"Treatment of an Underground Mine Pool with an Ethanol Enhanced Sulfate Reducing Bioreactor at the Wildcat Mine", URS, 2009 to present.

"Bench Testing and Treatment System Design", Honeywell Virginia, May 2011

"Leviathan Mine Emergency Treatment", Lahantan Regional Water Quality Control Board, March 2011

"Development of a Workplan to Extend Seasonal Treatment at the Leviathan Mine, Burleson Consulting 2009

"Treatability Study for Water Treatment at the Almeda Mine, Oregon", Bureau of Land Management, 2009 to 2010.

"Treatability Study for Arsenic Removal at the Lower Brush Creek Mine, California", Burleson Consulting 2009 to present.

"Design Consulting for an RCTS Treatment System at Cooke City, Montana", Pioneer Technical Services 2009 to present

"Design and Consulting of Underground Passivation at the Rodeo Deposit", Barrick Goldstrike 2009 to present

"Design and Installation of an RCTS Treatment System at the Kensington Mine, Alaska", Coeur Alaska 2009

"Design, Installation and Start-up of an RCTS Treatment system at the Soudan Mine, Minnesota" Minnesota Department of Natural Resources 2009 to 2010

"Design, Installation and Startup and Consulting of an RCTS Treatment System for Bioplant Pre-treatment at Landusky Montana" Spectrum Engineering 2009 to 2010

"Design and Consulting for an RCTS Treatment System at the Argenta Mine" Baker Hughes 2009

"Design, Installation, Start-up and Consulting for RCTS Treatment System at Swift Gulch, Zortman Montana" Spectrum Engineering, 2008 to 2010

"Startup and Operation of Bioreactors at the Nacimiento Mine" ERRG, 2008 to present

"Design and Consulting for Neutralization of a 6 Billion Gallon Pitlake" Newmont Lone Tree Mine, 2008-present

"RCTS Demonstration Project at the Grouse Creek Mine, Idaho" Hecla, 2008

"Demonstration of the RCTS at Gladstone" Golder, USEPA, BLM, 2008

"Design Consultation and Start-up for the Elizabeth Mine" Weston Solutions, USEPA 2008 to present

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